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COGNITION, PSYCHOLOGY AND COMMUNICATION FAILURES: FROM INADEQUATE TRANSLATIONS TO PEARL HARBOR

The paper argues that it is possible to provide a partial explanation especially in cognitive, sociological and psychological terms for the fact that the US – Japan negotiations prior to Pearl Harbor in 1941 failed the way they did.
The analysis seeks to show in detail how the role of mistranslations of some of the Japanese coded instructions which were sent from Tokyo by Foreign Minister Togo to Ambassador Nomura in Washington, D.C., and intercepted and decoded by the US military sigint personnel contributed to the failure of the negotiations, thereby making the December 1941 events at Pearl Harbor virtually unavoidable.

KEYWORDS: translation, cognition, misunderstanding, communication, military intelligence

INTRODUCTION

As noted by Kelkar et al. (2013: 119), "culture matters to the extent that a cultural perspective provides worldly insights into supposedly universal psychological processes," and is important with regard to the processes of interpreting and understanding what goes on in the world since "culture regulates how people perceive, explain, and respond to various phenomena."

This is the starting point for much of the analysis I propose to offer below regarding the question as to why the negotiations between the United States and Japan on the situation in the Pacific in 1941 failed the way and to the extent they did. The analysis seeks to explain how some of the assumptions made and how some of the conclusions drawn in such intercultural communication situations as political negotiations, if they are never properly reviewed and reconsidered, sometimes turn out to be drastically incorrect and even fatal. That is, if we misinterpret something we perceive or experience in our environment, we may run the risk of misunderstanding the world somehow, and end up, on the basis of such a misconception or misunderstanding, making a mistake we might otherwise have been able to avoid.

Keiichiro Komatsu, a Japanese historian, specifically argues in his historically oriented analysis of the developments that led up to what happened in Pearl Harbor in December 1941 (Komatsu 1999, especially Ch. 9 but also *passim*) that poor translations were a major contributing factor to the emergence of some serious misunderstandings between the US and Japan. Komatsu specifically argues that some of the coded messages (known at the time as "Magic") which were sent by Japanese Foreign Minister Togo in Tokyo to Ambassador Nomura in Washington, D.C., and, which were, unbeknownst to the Japanese, intercepted and cracked by the US military intelligence personnel, were translated from Japanese into English inadequately and came to contain serious misunderstandings which contributed in a nontrivial degree to the failure of the US – Japanese negotiations in a most unfortunate manner.

While Komatsu's analysis appears convincing as far as the argumentation related to historical and political facts is concerned, it is equally clear that his comments on the translation problems examined and the eventual translation mistakes noted are not particularly profound; rather, his argumentation merely makes the claim credible that certain parts of the original Japanese source texts were not translated in an adequate manner, and that some texts were in fact translated, if not incorrectly, at least infelicitously. (Komatsu's book has some 350 pages of actual analysis, and out of these only a dozen pages specifically address translation problems (Ch. 9).) Since Komatsu is a historian and not a translation studies scholar, this is of course not very surprising as such. It is my intention in this paper to add some credibility to Komatsu's argumentation by providing some explanations for the phenomena of misunderstanding and mistranslation Komatsu considers in his study.

Notably, some of the translators working for the US military prior to Pearl Harbor made in the course of their work decisions which later made them subscribe to interpretations which were, unfortunately, not the only possible readings of the Japanese texts they were working on but which, equally unfortunately, actually caused their translations to contain readings and nuances which the original Japanese source texts did not have. This in turn caused the American military and political decision makers to act on data which was not equivalent to the data contained in the original Japanese texts. Consequently, some of the assumptions made by the American negotiators in the course of the negotiations were different from those made by their Japanese counterparts, and were in fact not warranted. Therefore, a number of misconceptions and misunderstandings ensued, and the negotiations did not proceed in a particularly successful manner at all but rather failed the way they did.

For the purposes of the present paper, I will examine in detail only one piece of linguistic data which proved problematic and ultimately caused a major translation problem, a linguistic item which then seriously hampered the US – Japanese communication. This is the item which is transliterated in English as *saigo*, and

which has either the meaning ‘last’ or the meaning ‘latest’, depending on the context. I will examine in some detail some of the background to the problem from cognitive, sociological, and psychological viewpoints, and argue that the linguistic and communicative misfortune of mistranslating the item consistently was mainly due to the fact that the military intelligence principle of classifying information combined with the stress associated with the task of translating the intercepted messages under demanding circumstances constituted a combination which virtually conspired to make things go wrong.

SAIGO: SELECTING THE WRONG INTERPRETATION UNDER ADVERSE COGNITIVE CONDITIONS

The mistranslation of *saigo* was no isolated event in the long chain of events which culminated in the Japanese attack on Pearl Harbor in December 1941; rather, it was an incident which a perceptive analyst could have seen coming had the analyst been in possession of a holistic view of the developments between the US and Japan. This is a point which is convincingly argued by Komatsu (2001: 3), who suggests that war broke out between the two countries “after the negotiators from both sides had been significantly misled and confused by the misinterpretation of Magic. It can be said that cumulative misconception between the US and Japan gave the mistranslations a direction and force they would otherwise have lacked.”

Against this background, consider the systematic mistranslations of the expression *saigo*. This is an expression which recurs a number of times in two proposals which the Japanese sent to their ambassador Nomura and which the US sigint personnel intercepted. I quote here the essence of the case of the two proposals directly from Komatsu (2001: 20), which is a more recent summary of the main points of Komatsu (1999):

> Foreign Minister Togo sent the contents of the two Proposals A and B on the same day, 4 November, in three coded telegrams known as #725, #726 and #727, and instructed Ambassador Nomura that Proposal A was to be presented to the US first. Togo also explained to Nomura that Proposal B, as the second proposal to the US, had already been prepared in Tokyo to save time in the event of the American rejection of Proposal A. In his words, Proposal B ‘was drawn up with the thought in mind that it is better to prevent something from happening before it arise’.
>
> The tragedy was that the Americans had read all of these messages in advance through Magic before Nomura passed the proposals to them, and therefore they were not in a position to consider Proposal A seriously when it was presented to them on the 7th. When one knows that their counterparts in the negotiations had already prepared the next proposal in the event of one’s refusal, who would wish to consider the first proposal? Then, Proposal B

> was presented to the US on the 20th. Thus, in these crucial times nearly two weeks between the presentation of Proposal A and that of Proposal B were entirely wasted, and this was not known by the Japanese at that time.

What is remarkable about the failure of the negotiations is that a nontrivial part of the Magic messages the US intercepted were thus translated into English in a way which gave the US decision makers a seriously misleading picture of the Japanese position on the issues discussed, and that the consequent misconceptions were so compatible with the existing preconceptions the US negotiators had of their Japanese counterparts that no one on the US side ever felt that there was, at any time, any need to review the translations properly to make sure that the information gained from the intercepted messages was actually correct and accurate. I will consider later in some detail some of the sociological and psychological factors that contributed to the emergence of this state of affairs.

Regarding the mistranslation of *saigo*, Komatsu (2001: 21) notes, in particular, that:

> Amongst a number of serious mistranslations by Magic, an example is the term *saigo*, which was translated as 'final' [already] in Proposal A. In the dictionary, it is true that it can mean 'last' (hence 'final'), but *saigo* can also mean the 'latest'. Although it was used to mean 'the latest' repeatedly in Proposal A, it was translated as 'the last' by Magic every time when it appeared. This despite the fact that the Magic interpreters correctly translated the passage explaining that Proposal B had already been prepared by Tokyo as a 'substitute plan' in the event 'If there appears to be a remarkable difference between the Japanese and the American view [on Proposal A] ', and thus it was impossible to be understood as a 'final proposal'… . Consequently, Magic created more aggressive and fearsome images of the Japanese than they really were.

Komatsu (*ibid*.) further notes that "the same mistake was made repetitively by Magic, and even in the post-war period many observers have been misled by the Magic version of the texts."

The interesting question here then is why the mistake of translating *saigo* as 'last' or 'final' instead of the correct or at least more warranted 'latest' was made in the first place. I will now proceed to examine this question from cognitive, sociological, and psychological points of view, starting with human cognition.

ON THE COGNITION OF HUMAN TRANSLATION UNDER STRESS: A DOUBLE THREAT

In Hietaranta (2014: 216-217), I argue that translating under aggravating conditions may result in performance which is lacking in one way or another, and that this is so because the cognitive resources of the brain may then not be enough for the task at hand. Under such circumstances, it may happen, in particular, that the

brain stops using its analytical mode of processing information (cf. Berger 2007), and switches over to the experiential mode, which relies on past experience and intuition instead of conscious analysis. In such a case, it may further happen that a particular part of a source text gets processed, due to the automation associated with experience and intuition, somewhat glibly or superficially so that something in the text in question is inadvertently overlooked and ignored. In the best case scenario, then, the result may be a harmless misunderstanding; in the worst case scenario, a catastrophe may follow.

This line of argumentation seems to be fully in line with what is suggested by Schwarz (2000: 434), who argues that "affective states influence which strategy of information processing individuals are likely to adopt." To be sure, Schwarz's analysis is based on data which has nothing to do with translation as such, but his conclusions still point in the same direction as is being suggested here.

What is perhaps even more striking is Schwarz's (*ibid*.) quote from Luce, Bettman and Payne (1997: 384), who specifically note that "decision processing under increasing negative emotion both becomes more extensive and proceeds more by focusing on one attribute at a time." Thus, if the tension between the US and Japan indeed increased towards the end of 1941 as is suggested by Komatsu (1999: Ch. 7 and *passim*), it is not surprising that at least some of the translators working for the US sigint forces may have focussed, in the course of their translation work, at times on a relatively limited set of attributes in the texts they were translating, and may therefore have missed some of the textual and cultural clues which translators working under more relaxed and positive conditions might have been able to detect and take into account in their work. In other words, while the US translators may not have consciously been limiting their interpretations of the Magic messages to readings which the US side was expecting to see in the texts, the translators may still have had their attention unintentionally directed at what would be the most probable and most compatible readings in the eyes (or rather, brains) of the US decision makers.

Assuming thus that human beings as text users have a need to arrive at an acceptable interpretation of a text under any circumstances and that the brain is programmed not to waste any of its cognitive resources so that even emergencies can be handled with relative certainty (cf. Baars and Gage 2010, Mustajoki 2012: 228), it seems reasonable to argue that the US translators working on the Magic messages had an exceptionally hard time doing their job. First, they were required to work under conditions which greatly emphasized deadlines: military operations and the political operations associated with them can be successful only if timing is correct. Therefore, as tension between the US and Japan kept growing for most of the year 1941, it is obvious that the conditions the US Magic translators were working under were becoming more and more stressful by the day. In such a situation, it is fully understandable that individual translators might try to ease the cognitive load created by the need to arrive at adequate translations by grasping

the first sensible interpretation of a text that come their way. Unfortunately, one obvious way of achieving this goal is by means of not analysing every aspect of a text meticulously on the assumption that past experience of the same text type is a reliable guide to future action. If this happens, it is only a short step to the additional assumption that once a workable reading is found, there is no need to look any further for any other interpretation or reading for comparison purposes, explicit comparison involving competing solutions being cognitively even more demanding than the task of finding a solution to a single problem.

Another important aspect of the issue of finding an appropriate translation equivalent is the fact that the very task of translating as such may be viewed as a kind of threat quite generally, regardless of the conditions the translator is working under. In Hietaranta (2014), I specifically argue that if one regards a translation task as a type of threat, it becomes possible to explain certain failures of communication through translation, and suggest that misunderstandings of source texts in the case of translations and of even original, untranslated texts sometimes occur because of the way the human brain is designed to keep a sizeable portion of its processing capacity available for any contingencies or even emergencies which may come its way. A distinctly rational and therefore time-consuming analysis is too much of a strain on the brain, and is occasionally abandoned and a lighter, intuitive approach to linguistic problem-solving is adopted instead. In this way, if a threat is detected, the problematic situation which is causing too much of a load on the brain can be dealt with in a manner which is at least seemingly adequate and thus acceptable even to the conscious mind. The price one has pay for such a solution to the cognitive load problem is the possibility of selecting the wrong reading of a text even if the wrong reading makes perfect sense (cf. Hietaranta 2014: 217).

In a similar vein but in a different context, Sjöberg (2003: 18) argues that a remarkable amount of experience in a special field may ultimately lead a person to assume an approach where a semi-automatic mode of functioning is turned on so that the person in fact starts relying on intuition. Given that this is so, it is not out of the question that the US translators of the Magic texts sometimes inadvertently stopped analysing their Japanese source texts at a point where conscious textual analysis was still required, and that some of the translation mistakes made were consequently due to their unintentional use of the semi-automatic mode of information processing.

Finally, we should note here that what is argued above tallies well with what is independently suggested about the effect of competing solutions on information search and thus problem solving in the study of decision making by Phillips et al. (2014: 104), who note on the basis of their experiments that even if "in choices between uncertain options, information search can increase the chances of distinguishing good from bad options," it is also the case that "competition drastically reduces information search prior to choice". If this is so, it is more than likely that the US translators working on the Magic texts may have suffered

from the absolute necessity of having to come up with acceptable translations from amongst a number of possible candidates within a relatively short time span, and, accordingly, may indeed have occasionally stopped in the course of their work searching for information at a point where a correct translation of a source text would still have necessitated such an extra effort. Since no such extra effort was expended to secure the additional information for the correct interpretation of the source text, a mistranslation sometimes ensued.

A SOCIOLOGICAL LOOK AT TRANSLATION

Another explanatory factor which one may invoke to explain translation mistakes such as those found in the Magic translations is the sociological nature of translation in professional settings, in particular. Specifically, since different languages operate in different cultures, it is mandatory that a translator be familiar with how culture affects the linguistic formulations used in any particular community.

It is most unfortunate that the essay *The Stranger: An Essay in Social Psychology* by Schuetz (1944) only appeared towards the end World War 2. Had the essay been available a few years earlier and known to at least some of the US translators and decision makers involved in the developments leading up to Pearl Harbor, the outcome of the whole series of events might have been quite different.

I wish to suggest here that Schuetz's analysis of how a stranger enters, internalises, and interprets the activities observable in an alien community can be used to explain one specific aspect of the failure of the negotiations between the US and Japan in 1941. Specifically, it appears that the Americans' inability and reluctance to see the Japanese standpoint in the negotiations on the political questions discussed in 1941 was due in no small measure to the fact that the Americans had not been able to penetrate the cultural barriers between the US type of society and the Japanese way of life.

That such a familiarity is required in intercultural communication situations is due to the fact that one can only understand the members of a foreign community and their activities if one is able "to interpret the cultural pattern of a social group which he approaches and to orient himself within it" (Schuetz 1944: 499). Such an understanding in turn is required because otherwise it is not possible for the approaching stranger to make sense of the various signals emitted by members of the other culture. The point is put succinctly by Schuetz (1944: 504) as follows (note Schuetz's use of the word *translate* here):

> The approaching stranger has to 'translate' its terms into terms of the cultural pattern of his home group, provided that, within the latter, interpretive equivalents exist at all. If they exist, the translated terms may be understood and remembered; they can be recognized by recurrence; they are at hand but not in hand. Yet, even then, it is obvious that the stranger

> cannot assume that his interpretation of the new cultural pattern coincides with that current with the members of the in-group. On the contrary, he has to reckon with fundamental discrepancies in seeing things and handling situations.

I suggest, in line with Schuetz's general point of view above, that another factor which contributed to the failure of the US – Japan negotiations was the limitation American culture and the then political situation jointly put on the US negotiators' ability to interpret some of the communicative signals emitted by the Japanese negotiators as well as the further limitation on the US translators' ability to review the interpretations of the Japanese Magic messages they had reached at a given stage of their work.

Consider first the US attitude towards the Japanese negotiators and the proposals made by the latter. Since attitudes seem to develop gradually and, most notably implicitly through classical conditioning (see e.g. Olson and Fazio 2001), it follows that people are not nearly always aware of how their worldviews are formed and what types of ingredients their (pre)conceptions of the world come to include. It is difficult if not impossible to observe oneself as an outsider. Hence, the US negotiators were misled to interpret some of the signals from their Japanese counterparts in a way which they were not even aware of. Since every social group, small or large, has its own internal code for interpreting the world and its events (cf. Schuetz 1944: 505), the Americans were not sufficiently conscious of the nuances of Japanese military or even more generally political culture and thus misread some of the clues in the Japanese turns of communication. As a result, rather sour opinions on what was coming from the side of the Japanese started surfacing.

Equally, one can also argue that some of the US translators working on the Magic texts were probably blind, for similar reasons, to some of the clues which were actually there in the Japanese texts, and thus could not produce adequate translations to match all the essential information and all the niceties of the Japanese source texts (cf. Komatsu's (2001: 6) discussion of the difference between the Japanese *jiken* and *jihen*). Thus, a number of misconceptions ensued which caused the US translators to assume attitudes towards the Japanese which made the translators see the source texts in a particular light and accordingly attach to them interpretations which the American worldview could readily accept.

THE MILITARY ASPECT OF MAGIC TRANSLATION MISTAKES AND MISUNDERSTANDINGS

That there has been, in the opinion of some scholars at least, relatively little research into the sociology of conflict is a view which has been propagated by e.g. Weller and Quarantelli (1973: 665, 668), who argue that "it is widely agreed that sociological thought does not adequately deal with the dynamic aspects of social

life," and go on to claim that "failure to identify the social properties of collective behavior is one of the major barriers to development of a fully sociological theory of collective behavior and, consequently, is a primary factor in promoting the gap between collective behavior and general sociological perspectives".

While the situation has improved over the last forty years (for instance, in *Journal of Sociology* there are 35 abstracts containing the word *conflict* in the articles published between 1975 and 2015), it still seems to be the case that that the specifics of warlike situations are seldom discussed in sociological journals. For example, again between 1975 and 2015, *American Journal of Sociology* published a total of 215 articles where the abstract contained the word *conflict*, but out these 215 articles less than 15% (31 instances) also had the word *war* in their abstracts.

The sociological aspects of conflicts are thus not particularly well represented among sociological research topics in general. It is therefore not very surprising that in the exceptionally delicate case of Pearl Harbor analyses sociology is not very well represented. Even so, what is known (e.g. on the basis of the documents cited by Komatsu 1999) about the activities of the people who worked in the Pearl Harbor setting seems to suggest that certain problems occurred because information was not shared appropriately or because information was not shared at all. The latter scenario is understandable in that classifying information and restricting access to certain types of information has always been part and parcel of military life. Yes, in the case of the translators dealing with Magic texts, such a decision to make some information classified entailed that there was no systematic, proper cross-checking mechanism to detect eventual errors made by the translators. As no individual translator had unrestricted access to any other translator's work and as translators were busy all the time, there was no proper system for checking the correctness of all the translations in place. That the translators were indeed working under considerable pressure is clear e.g. from the remark made by Lt. John Lietwiler in a letter dated 16 November 1941, where he discusses the US military intelligence personnel efforts to crack the main Japanese naval code: "We are reading enough current traffic to keep two translators very busy" (Wilford 2002: 17).

That not even the information the translators did manage to produce correctly was shared appropriately among the relevant military and political decision makers is a claim which is made in particularly forceful manner by e.g. Jones (2007: 386):

> In the months leading up to 7 December 1941, crucial bits of information were scattered among Army and Navy intelligence in Hawaii, their counterparts in Washington, the State Department, the White House, and Ambassador Grew's office in Tokyo, among other players. According to investigators, Army and Navy intelligence personnel in Honolulu were not sharing information regularly, nor was Washington sharing what it knew with the military commands in Hawaii to a sufficient degree.

In sum, the exceptionally demanding circumstances the translators were working under coupled with the exceptional sociological properties of their environment

conspired in an unfortunate manner to create a setting where certain types of translation mistakes, including cultural misconceptions and sheer linguistic misunderstandings, were waiting to be made.

A FINAL NOTE ON THE INGREDIENTS OF A GOOD TRANSLATOR

It is well-known that systematic translator and interpreter training did not exist in the years preceding Pearl Harbor, which undoubtedly had an adverse effect on the quality of the work produced by the translators working for the US military at the time. The problem was in fact aggravated further by the fact that such a lack of systematic training in translation had several consequences of the most diverse kinds. First, the nonexistence of professional training in the field of translation resulted in the translators' inability to domesticate their translations systematically to any notable extent, which made some parts of the translations look or sound alien to the native American reader. The translation was in English but only in terms of the vocabulary; some of the sentence structures and textual divisions used were unavoidably unnatural for a native speaker of English. (The translated Magic data is now publicly available in its entirety on a set of 8 CD's e.g. from http://www.paperlessarchives.com/wwii-pearl-harbor-magic-files.html.) Because of such strangeness in the translations, some parts of them were not very easy to understand.

Secondly, since there was no systematic translator training of the present-day variety available (cf. e.g. Gile 2009), it followed that very little attention was paid to the personal characteristics of those selected for the translation tasks. This in turn was an undesirable development in that persons who are good at translating are typically people who can make valid inferences on the basis of the texts they are working on, which is of special significance if the source text of the translation is somehow unclear or contains uncertain passages, i.e. pieces which, in the case of the Pearl Harbor texts, the sigint person who intercepted the message was not able to recover properly. A mediocre translator is never an asset but rather a liability, and this is true in conflict situations, in particular.

Finally, modern translators are also trained to work in teams, and are thus sociologically prepared to take part in joint efforts. In the days of Pearl Harbor, there could be no guarantee that the persons who were chosen for the translation work could actually benefit from each other's work by consulting other translators even to the extent that such consultation was permitted. For this reason also, some of the scarce human resources available at the time on the US side of the conflict were again wasted.

BIBLIOGRAPHY

BAARS, B.J./ GAGE, N.M. (2010): *Cognition, brain, and consciousness: Introduction to cognitive neuroscience*, Amsterdam.

BERGER, CH.R. (2007): "A tale of two communication modes: When rational and experiential processing systems encounter statistical and anecdotal depictions of threat", *Journal of Language and Social Psychology*, 3/26, 215-233.

GILE, D. (2009): *Basic concepts and models for interpreter and translator training*. Revised edition, Amsterdam / Philadelphia.

HIETARANTA, P. (2014): "Understanding misunderstanding: Towards a cognitive view of misunderstandings in translation", in: BENDA, P./ BABIĆ, Ž./ BIJELIĆ, T. (eds.): *Going against the grain: Essays on literary and language studies*, University of Banja Luka, 215-223.

JONES, C. (2007): "Intelligence reform: The logic of information sharing", *Intelligence and National Security*, 3/22, 384-401.

KELKAR, A.S./ HOUGH, M.S./ XIANGMING, F. (2013): "Do we think alike? A cross-cultural study of executive functioning", *Culture and Brain*, 2-4/1, 118-137.

KOMATSU, K. (1999): *Origins of the pacific war and the importance of "magic"*, New York.

KOMATSU, K. (2001): "Misunderstanding and mistranslation in the origins of the Pacific War of 1941-1945: The importance of 'magic'", available at http://theburmacampaignsociety.org/. Accessed on 12 February 2016.

LUCE, M./ BETTMAN, J./ PAYNE, J.W. (1997): "Choice processing in emotionally difficult decisions," *Journal of Experimental Psychology: Learning, Memory and Cognition*, 23, 384-405.

MUSTAJOKI, A. (2012): "A speaker-oriented multidimensional approach to risks and causes of miscommunication," *Language and Dialogue*, 2/2, 216-243.

OLSON, M.A./ FAZIO, R.H. (2001): "Implicit attitude formation through classical conditioning", *Psychological Science*, 12/5, 413-417.

PHILLIPS, N.D./ HERTWIG, R./ KAREEV, Y./ AVRAHAMI, J. (2014): "Rivals in the dark: How competition influences search in decisions under uncertainty", *Cognition*, 133, 104-119.

SCHUETZ, A. (1944): "The stranger: An essay in social psychology", *American Journal of Sociology*, 6/49, 499-507.

SCHWARZ, N. (2000): "Emotion, cognition, and decision making", *Cognition and Emotion*, 4/14, 433-440.

SJÖBERG, L. (2003): "Intuitive vs. analytical decision making: Which is preferred?" *Scandinavian Journal of Management*, 1/19, 17-29.

WELLER, J.W./ QUARANTELLI, E.L. (1973), "Neglected characteristics of collective behavior," *American Journal of Sociology*, 3/79, 665-685.

WILFORD, T. (2002): "Decoding Pearl Harbor: USN cryptanalysis and the challenge of JN-25B in 1941", *The Northern Mariner/Le marin du nord*, 1/12, 17-37.